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ABSTRACT

One of a set of fourteen instructional outlines for use in a course to train novice firemen, this guide covers the topic of ladders. Designed for the combination lecture and practical application method of teaching, this part of the course explains and demonstrates various types of ladder construction, handling techniques, and maintenance. Its objective is met when the fireman achieves proficiency in climbing ladders and making raises both singly and as part of a team. This outline is to be used in conjunction with the International Fire Service Training Association's manual, "Ladder Practices" (see note). Also included is a handout on ladder inspection. (An outline of the whole course covering all fourteen topics briefly is provided in the first volume of the set--CE 016 662.) (ELG)

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FIP 3016

# Ladder Practices

FIRE SERVICE TRAINING

LADDER PRACTICES

UE 016 665

Revised

June, 1974

## INTRODUCTION

The use of fire department ladders is mandatory many times for rescue purposes or to enable the fire department to extinguish fires on upper floors. These requirements make it a necessity for fire fighters to perform ladder operations with a high degree of proficiency. To develop teamwork, efficiency of operation and safety, it is important that each fire fighter understand the others' roles in ladder work.

For the above to be accomplished, it is necessary for those involved to train in ladder work in a sequence of instruction under proper guidance.

This outline was developed from and for use with the International Fire Service Training Association Manual LADDER PRACTICES.

### Presentation

This outline has a coverage of ladder construction, design, handling techniques, raises, and other information ranging from basic to long ladders with poles, It is the instructors' responsibility to adapt this outline to the local situation. This course is designed for the combination lecture and practical application method of instruction.

## OBJECTIVE

To develop the firemen's skill in ladder operations so that he can demonstrate proficiency by: properly climbing ladders, making one man raises and working as a team making ladder raises. This will be considered accomplished when performed to the satisfaction of the instructor.

## REQUIRED MATERIALS

1. Ladders and location for using.

| COURSE OUTLINE | GUIDES |
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| I. Opening Remarks. | |
| A. Ladder usage is required in these cases. | |
| 1. Rescue of trapped occupants from high places or upper floors. | |
| 2. Fire control of upper floors. | |
| B. Importance of ladder training. | Give example where life or property loss from poor ladder usage |
| 1. Improves efficiency. | |
| 2. Teamwork. | |
| 3. Safety. | |
| II. Ladder Terms and Definitions. | |
| A. Terms - explain various terms as they apply to ladders. | |
| 1. Ground ladders. | |
| 2. Wall or straight ladders. | |
| 3. Extension ladders. | |
| 4. Poles, tormentors or stay poles. | Point out various parts of ladder |
| 5. Toggle. | |
| 6. Spurs or spears. | |
| 7. Main or bed. | |
| 8. Fly or top. | |

| COURSE OUTLINE | GUIDES |
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| 9. Heel or butt.<br>10. Top or tip.<br>11. Beam.<br>12. Truss.<br>13. Rails.<br>14. Hooks.<br>15. Rungs.<br>16. Halyard.<br>17. Pulley.<br>18. Pawl, lock or clog.<br>19. Braces.<br>20. Blocks.<br>21. Stops.<br>22. Guides.<br>23. Tie rods.<br>24. Beam bolts.<br>25. Protection plates.<br>26. Anchor.<br>B. Ladder types. Explain various types of ladders and their intended use. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| 1. Wall or straight ladder. | Show wall ladder |
| (a) Consist single section. | |
| (b) Non-adjustable. | |
| (c) Used for quick access one and two story buildings. | |
| (d) Usual lengths 12, 14, 16, 18 and 24 feet. | |
| 2. Extension ladders. | Show extension ladder |
| (a) Adjustable in length. | |
| (b) Consist two or more sections. | |
| (c) Designed to store in minimum space, but extend to various heights. | |
| (d) Requires more manpower than wall ladders. | |
| (e) May have tormentor poles. | |
| (f) Length 24 to 65 feet. | |
| (g) Length determined when ladder fully extended. Is not measurement of each section as in painters' ladders. | |
| 3. Combination A-Frame or baby extension ladders. | Show A-Frame ladder |
| (a) Double use. | |
| (1) Can be adjustable in length. | |
| (2) May also lock sections to make into an A-Frame ladder. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (b) Used for reaching small heights in buildings. | |
| (c) Length determined by lengths of sections. | |
| 4. Combination "Jacknife", "A" and single ladder. | Show "Jacknife" ladder |
| (a) Consist single section. | |
| (b) Hinged in middle to permit use a wall ladder or as "A" Frame ladder. | |
| (c) Length 14 feet open, closed 7 feet. | |
| 5. Roof ladders. | Show roof ladder |
| (a) Similar to wall ladder. | |
| (b) Hooks. | Point out hooks |
| (1) Are folding. | |
| (2) Used to anchor ladder to roof ridge. | |
| (c) Used on slanted roofs for men to work from. | |
| (d) Lengths 12 to 20 feet. | |
| 6. Attic ladders. | Show attic ladder |
| (a) Are foldable. | |
| (b) Designed for attic access. | |
| (c) Lengths - usually short, 8 to 14 feet. | |
| 7. Power-operated aerial ladders. | Discuss only enough for men's general knowledge |
| (a) Mounted on truck chasis. | |
| (b) Mechanically operated - usually hydraulic. | |

| COURSE OUTLINE | GUIDES |
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| (c) Power from truck engine. | |
| (d) Ladder of trussed metal. | |
| (e) Used to reach high heights quickly. | |
| (f) Lengths - standard 65 to 100 feet, but ladders do exist with a reach of 200 feet. | |
| 8. Elevating platforms. | |
| (a) Mounted on truck chasis. | |
| (b) Mechanically operated. | |
| (c) Power from truck engine. | |
| (d) Boom may be tubular or trussed construction. | |
| (e) Designed to reach high locations. | |
| 9. Pompier ladders - explain. | Show pompier ladder |
| (a) Consist single beam, which rungs pass through and a large goose-neck hook at tip. | |
| (b) Once used extensively, but with increase of modern fire escapees and aerial ladders, seldom used now. | |
| (c) Now used mainly for training rookies. | |
| III. Design and Construction - ladders constructed from aluminum alloy, steel alloy, wood, and fiberglass. | |
| A. General recommendations. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| 1. National specifications recommend metal for ladder construction. | Point out various features of wood ladder construction |
| 2. Reasons. | |
| (a) High grade wood difficult to obtain. | |
| (b) Metal ladders have more advantages. | |
| 3. F. D. ladders are constructed stronger than ordinary ladders because of the heavy load which may be put upon them. | |
| B. Aluminum alloy ladders. | Demonstrate various types of aluminum ladder construction |
| 1. Materials heat treated aluminum alloy. | |
| 2. Construction. | IFSTA Ladder Manual, P. 14, Figs. 1, 2, & 3 |
| (a) Usually riveted. | |
| (b) Usually two rails held together with spacers. | |
| (c) Used to construct ground and aerial ladders. | |
| 3. Advantages. | |
| (a) Lighter. | |
| (b) Less maintenance - no coating required. | |
| (c) Easy clean. | |
| (d) Splinter-free surface. | |
| (e) Will not rot. | |

| COURSE OUTLINE | GUIDES |
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| 4. Disadvantages.<br>(a) Good conductor of electricity.<br>(b) Possibility of freezing to ladder in extremely cold weather.<br>(c) Susceptible to heat damage. | |
| C. Steel alloy ladders.<br>1. Not practical for ground ladders.<br>2. Used in aerial ladder construction.<br>3. Construction.<br>(a) Trussed.<br>(b) Trusses from triangles to provide for most strength. | IFSTA Ladder Manual, P. 15, Fig. 4 |
| D. Plastic fiberglass ladders.<br>1. Use in fire service on increase.<br>2. Construction.<br>(a) Designed with fire retardant properties.<br>(b) Heat distortion no longer serious problem.<br>(c) Materials.<br>(1) Fiberglass rails.<br>(2) Aluminum rungs. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (3) Rails and rungs permanently bonded. | |
| (4) Ends sealed. | |
| (5) Ends usually equipped. | |
| a. Vinyl-bumpers. | |
| b. Vinyl-tread steel heel plates. | |
| (d) Special equipment - some fiberglass ladders may be equipped with an automatic beam equalizer device. | IFSTA Ladder Manual, P. 16, Fig. 5 |
| 3. Advantages. | |
| (a) Light in weight. | |
| (b) Nonconductive wet or dry. | |
| (c) Splinter proof. | |
| (d) Chemical resistant. | |
| (e) Easy one man operation. | |
| (f) High fire retardant properties. | |
| (g) Minimum heat distortion. | |
| (h) Strong, sturdy. | |
| (i) Safety factor 6 to 1. | |
| (j) Use polypropylene halyard rope - strong and resistance to water absorption, rot, mildew and heat. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| E. Wood ladders. | Show types of wood ladders |
| 1. Few manufactured today. | |
| 2. Many still in use. | |
| 3. Materials. | |
| (a) Beam. | |
| (1) Douglas fir - free from knots, checks, pitch pockets and wind shakes. | |
| (2) Cut from extremely tall fir trees. | |
| (3) Two-year drying period. | |
| (4) Moisture content of wood must be from 9 to 12% (excess moisture will cause shrinkage). | |
| (5) Special cut used grain runs diagonally from rail to rail. | Show special cut |
| (6) Of every million feet checked, usually a thousand is acceptable for ladder construction. | |
| (b) Rungs - constructed from second growth ash or hickory. | IFSTA Ladder Manual, P. 17, Fig. 6 and 7 |
| 4. Construction. | |
| (a) Rungs support. | |
| (1) In ladder rail. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (2) Truss block. | |
| (3) One-piece rung spacer block. | |
| (b) Solid beam - rungs placed in center of beam. | |
| (c) Metal key, nail or screw keeps rungs from turning. | |
| (d) Tie rods. | |
| (1) Holds assembly together. | |
| (2) Spaced four to five feet apart. | |
| F. Truss construction. | IFSTA Ladder Manual, P. 18, Fig. 8 |
| 1. Definition "truss" - to support, strengthen, or stiffen as a beam. | |
| 2. Used in wood and metal ladder construction. | Show truss construction |
| 3. Parts. | |
| (a) Bottom or main rail. | |
| (b) Top or truss rail. | |
| (c) Rungs. | |
| (d) Truss blocks. | |
| IV. Preliminary Methods and Skills. | |
| A. Mounting of ladders on apparatus. | IFSTA Ladder Manual, P. 22, Fig. 9 and 10 |

| COURSE OUTLINE | GUIDES |
|---|---|
| 1. Aerial or service trucks. | |
| (a) Usually mounted flat, flyup. | |
| (b) Locked in place by bar. | |
| 2. Pumpers. | Indicate where ladders are carried on truck |
| (a) Usually mounted on side. | |
| (b) Held in place by clamps or cables. | |
| NOTE: All firemen should be able to answer the following questions concerning their equipment. | |
| (a) Where are the ladders mounted on your pumper? | Ladder position |
| (b) Are the heel plates toward the front or rear of the apparatus? | |
| (c) Can the roof ladder be removed and leave the extension ladder in place on the pumper? | |
| (d) Is the fly section of the extension ladder on the inside or outside when the ladder is on the pumper? | |
| (e) How are your ladders secured in place? | Type securing device |
| (f) How is the unlatching done so the ladder can be removed? | |
| (g) Are the ladders provided with mounting protection plates? | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (h) Where two or more ladders are mounted flat, one inside the other, must all the ladders be removed from the tier to secure one ladder? | |
| (i) What kind and how long are the ladders carried on your apparatus? | |
| B. Safety protect ladders that extend beyond rear of apparatus by: | Are ladder ends protected |
| 1. Covering ends with hose. | |
| 2. Bright paint. | |
| C. Selecting proper ladders. | |
| 1. Because of the various needs for ladders, many pumpers now carry 35 feet pumper extension ladders. | |
| 2. Table for selecting ladders. | Have verbal drill-selecting proper ladders |
| (a) One-story roof — 16 to 20 feet | |
| (b) Second story window — 20 to 28 feet | |
| (c) Two-story roof — 28 to 35 feet | |
| (d) Third story window — 35 to 50 feet | |
| (e) Three-story roof — 50 feet and over | |
| D. Removal of ladders from apparatus. | |
| 1. Aerial trucks. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| 2. Pumpers. | |
| 3. Safety precautions. | |
| (a) For ladders while being removed. | |
| (b) For the fire fighter. | |
| (c) For ladders removed but not used. | |
| E. Placing of ladders. | |
| 1. Fly section postion - except. | |
| (a) For the old type "fish-belly" trussed ladder, it is safe to place fly towards or away from building. | Demonstrate placing |
| (b) Usually the fly is placed on inside towards building. | |
| (c) Reasons for fly section on inside. | |
| (1) Position ladder is in - fly is usually up. | |
| (2) Easier to be anchored by heel man for raise. | |
| (3) Man pulling halyard rope may face the building. | |
| 2. Spacing. | IFSTA Ladder Manual, P. 26, Fig. 11 and 12 |
| (a) Desired angle of 75° with ground. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (b) Reasons. | |
| (1) Too close to building - stability reduced. Top of ladder may pull away from building. | Demonstrate spacing and have students perform |
| (2) Too far from building - excess stress on ladder. | |
| (3) Too far - more difficult to climb. | |
| (c) $75^{\circ}$ permits easy climbing. | |
| (d) Butt of ladder should be out from base of building one-fourth ($\frac{1}{4}$) the length of ladder being used (length of ladder used divided by four equals spacing from building). | |
| (e) Spacing must compensate for overhangs and other projections. | |
| 3. Ladder anchoring for safety. | IFSTA Ladder Manual, P. 27, Fig. 13 |
| (a) By another fireman. | |
| (b) Use of rope or rope hose tool. | Have students practice anchoring |
| F. Procedures for climbing ladders. | |
| 1. Safety precautions. | |
| (a) Check placing of ladder. | |
| (b) Check heels. | Have students practice climbing |

| COURSE OUTLINE | GUIDES |
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| (c) Observe top of ladder to see if it rests firmly in a proper position. | |
| (d) Check pawls or dogs - properly set over rungs. | |
| (e) Check tormentor poles. | |
| 2. Body position while climbing. | IFSTA Ladder Manual, P. 29, Fig. 14, 15 and 16 |
| (a) Smoothly and rhythmically - bouncing to a minimum. | |
| (b) Body perpendicular to the ground. | |
| (c) Eyes front - occasionally glancing at top. | |
| (d) Hands grasping convenient rung. | |
| (e) While carrying equipment. | |
| NOTE: Instructor should stress form rather than speed. | |
| 3. Passing on the ladder. | Have students practice passing |
| (a) Man going up gives command, "Passing on right." | |
| (b) Person working on ladder moves left as far as safety allows. | |
| G. Working from a ladder. | |
| 1. Heel, hold ladder or | |
| 2. Anchor top of ladder. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| 3. Use safety belt or | |
| 4. Use leg lock. | IFSTA Ladder Manual, P. 30, Fig. 17 |
| 5. Observe margin of safety by providing one man for every ten (10) feet of ladder used. | |
| 6. 10 feet rule allows for safety factor for ladder passing. | Verbal drill, length of ladder and permissible men on ladder |
| 7. When rescue is to be performed, clear ladder of unnecessary personnel. | |
| H. Aerial ladder operation assistance. | IFSTA Ladder Manual, P. 30, Fig. 17 |
| 1. Place chocks. | |
| 2. Set jacks. | |
| 3. Wear safety belt while on ladder. | |
| 4. Ladder pipe - avoid rapid movements - may cause unnecessary strain on ladder. | |
| V. Ladder Maintenance. | |
| A. Inspecting ladders. | |
| 1. Yearly. | |
| 2. During cleaning. | |
| 3. During use. | |
| B. What to look for and check. | Have each student perform ladder inspection, compare results |

| COURSE OUTLINE | GUIDES |
|---|---|
| 1. Excessive wear.<br>2. Braces.<br>3. Slides.<br>4. Stops.<br>5. Locks.<br>6. Halyards.<br>7. Rivets.<br>8. Pulleys.<br>9. Cracks - splinters.<br>10. Tightness of.<br>(a) Rungs.<br>(b) Bolts.<br>(c) Rivets.<br>11. Welds for cracking.<br>12. Compression failure.<br>(a) Beams.<br>(b) Trusses.<br>(c) Separation blocks. | |

| COURSE OUTLINE | GUIDES |
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| C. Testing ground ladders. | |
| 1. Should be performed yearly. | |
| 2. Recommended tests do not create stresses that would contribute to failure of a safe ladder. | |
| 3. Twist test for rungs. | IFSTA Ladder Manual, P. 34, Fig. 23 |
| (a) Check by hand. | |
| (b) Use testing device for rungs that show signs of looseness. | Perform test |
| (c) Repair replace loose rungs. | |
| 4. Strength test for rungs. | IFSTA Ladder Manual, P. 35, Fig. 24 |
| (a) Use when visual inspection indicates possible faulty rung. | |
| (b) Perform test. | Perform test |
| (1) Take measurement. | |
| (2) Apply testing device. | |
| (3) Remeasure. | |
| (4) Results. | |
| (c) Replace faulty rung. | |
| 5. Recovery test for ladders. (Test based on ability of ladder to recover from load). | IFSTA Ladder Manual, P. 36, Fig. 25 |

| COURSE OUTLINE | GUIDES |
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| (a) Place ladder on supports. | |
| (b) Extension ladders. | |
| (1) Treat each section as individual ladders. | |
| (2) Separate ladder if possible. | |
| (c) Find test point. | Perform test |
| (d) Take measurement. | |
| (e) Place weight support on test point. | |
| (f) Add first 50 lb. weight. | |
| (g) Add second and third 50 lb. weights. | |
| (h) Add fourth weight of 25 lbs. | |
| (i) Add fifth weight of 25 lbs. (Total weight now 200 lbs.) | |
| (j) Let stand for 5 minutes. | |
| (k) After 5 minutes, remove load gradually. | |
| (l) Take measurement (wait 5 minutes after load removed). | |
| (m) Measurements should be within $\frac{1}{2}$ inch of original. If not, ladder unsafe. | |
| 6. Repairing ladders. | |

| COURSE OUTLINE | GUIDES |
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| (a) Mark areas to be repaired with chalk.<br>(b) Splinters, cut and sand down.<br>(c) Tighten ladder bolts only snug.<br>(d) Refinishing (wood ladders).<br>(1) Should be done when finish old or scratched.<br>(2) Remove old finish.<br>(3) Sand surfaces.<br>NOTE: When preparing, avoid scratching wood.<br>(4) Apply two coats sealer.<br>(5) Apply two coats spar varnish.<br>(e) Repairing metal ladders.<br>(1) Usually requires special tools.<br>(2) Follow manufacturers recommendations. | As project, repair ladders |
| VI. Handling Ladders.<br>A. Single wall ladders.<br>1. Characteristics.<br>(a) Metal or wood construction.<br>(b) May be trussed. | |

| COURSE OUTLINE | GUIDES |
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| (c) Lengths 5 feet to 35 feet. | |
| 2. Removal and nesting methods. | IFSTA Ladder Manual, P. 42, Fig. 26 |
| (a) Nested in troughs. | |
| (b) Short ladders nested in longer ladders. | |
| (c) Short ladders must be removed to obtain longer ladders. | |
| (d) Place unneeded ladders under truck. | Have students perform wall ladder operations |
| (e) Locking mechanism. | |
| (1) Crank or lever controlled. | |
| (2) Secures ladders in place. | |
| 3. Wall ladder operations (one man). | |
| (a) Removal from apparatus. | |
| (b) Carrying. | IFSTA Ladder Manual, P. 42, Fig. 27 |
| (1) Find center of balance. | |
| (2) Insert arm between beams. | |
| (3) Balance and carry. | |
| (c) Raising. | IFSTA Ladder Manual, P. 43, Fig. 28 |
| (1) Butt heel against building. | |
| (2) With ladder flat, maneuver under it. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (3) Walk ladder up to flat vertical position against building. | |
| (4) Stand to side and move heel of ladder from building. | |
| (5) Space ladder at proper angle. | |
| (6) To remove ladder, reverse procedure. | |
| 4. Wall ladder operations (two men). | IFSTA Ladder Manual, P. 44 and 45, Figs. 29, 30 and 31 |
| (a) Removal from apparatus. | |
| (b) Carries. | |
| (1) Shoulder. | |
| (2) Hip carry. | |
| (3) Arm's length carry. | |
| (c) Raising wall ladder (flat raise). | IFSTA Ladder Manual, P. 46 and 47, Fig. 32 |
| (1) Heel man places heel on ground and butts it. | |
| (2) Beam man maneuvers under ladder. | Have students perform two man wall ladder drills |
| (3) Beam man uses rungs to walk ladder to vertical position. | |
| (4) Men face each other. | |
| (5) Pivot ladder if necessary. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (6) Lower ladder against building. | |
| (7) Space ladder at proper angle. | |
| (d) Raising wall ladder (beam raise). | IFSTA Ladder Manual, P. 48 and 49, Fig. 33 |
| (1) Keeping rungs vertical, place heel on ground. | |
| (2) Heel man butts while pulling on top beam. | |
| (3) Beam man swings under and walks ladder up to vertical position. | Have students perform beam raise |
| (4) Pivot ladder. | |
| (5) Place against building. | |
| (6) Space ladder at proper angle. | |
| (e) To lower, simply reverse operations. | |
| B. Pumper extension ladders (two men). | |
| 1. Characteristics. | |
| (a) Lengths 24 to 35 feet. | |
| (b) Light weight construction. | |
| 2. Pumper extension ladder operations. | IFSTA Ladder Manual, P. 50, Fig. 34 |
| (a) Removal. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (1) Ladder location. | |
| (2) Securing procedure. | |
| (3) Removal procedure. | |
| (b) Carries. | IFSTA Ladder Manual, P. 51, Fig. 35 |
| (1) Shoulder. | |
| (2) Hip carry. | |
| (3) Arm's length carry. | |
| (c) Raising - flat raise. | IFSTA Ladder Manual, P. 53 and 54, Fig. 36 |
| NOTE: It is the responsibility of the lead-off man to select the location for the raise and to space the heel of the ladder to proper distance from the building. | |
| (1) Heel man butts ladder. | |
| (2) Beam man swings under ladder. | |
| (3) Beam man walks ladder up to a vertical position. | |
| (4) Pivot ladder (if necessary). | Have students drill with extension ladders |
| (5) Men face while extending ladder. | |
| (6) Lower ladder onto structure. | |
| (7) Lowering - reverse procedure. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (d) Raising - beam raise.<br><br>(1) Heel man butts ladder - with only one beam touching ground, other is in air.<br><br>(2) Beam man swings under ladder and advances it up, hand over hand, until ladder is in a vertical position.<br><br>(3) Pivot ladder (if necessary).<br><br>(4) Lower against building.<br><br>(5) To lower, reverse operations. | IFSTA Ladder Manual, P. 55, Fig. 37 |
| C. Roof ladders - used to permit safe operations on slanted roofs.<br><br>NOTE: When using as a short wall ladder, leave hooks closed and use wall ladder procedure.<br><br>1. Characteristics.<br><br>(a) Lengths 10 to 30 feet.<br><br>(b) 10-14 feet for pumpers.<br><br>(c) Light weight.<br><br>(d) May be trussed construction, metal or wood.<br><br>2. Removal.<br><br>(a) Ladder location.<br><br>(b) Securing devices. | IFSTA Ladder Manual, P. 57, Fig. 39 |

| COURSE OUTLINE | GUIDES |
|---|---|
| (c) Removal procedure. | |
| 3. Carries. | |
| (a) Normally one man using shoulder carry. | |
| (b) Use two men in crowds. | |
| 4. Using roof ladder. | IFSTA Ladder Manual, P. 59, 60 and 61, Fig. 41 |
| (a) Open hooks on ground. | |
| (b) One man climbs to top of ladder and locks in. | |
| (c) Man on ground butts heel of roof ladder against raised ladder. | |
| (d) With hooks away from man on ladder, he raises it to him. | Perform roof ladder operations |
| (e) Using hooks as skid slide ladder up until hooks drop over roof peak. | |
| (f) Mount roof ladder. | |
| D. Pumper extension and roof ladder combination. | Perform combination ladder drill |
| 1. Extension ladder and roof ladder are carried to desired location together. | |
| 2. Separate at use location. | IFSTA Ladder Manual, P. 51, Fig. 40 |
| 3. Use normal procedures for raising. | P. 58, Fig. 41 |

| COURSE OUTLINE | GUIDES |
|---|---|
| (a) Shoulder carry. | IFSTA Ladder Manual, P. 63, Fig. 43 |
| (1) Positions. | |
| a. Heel man and top man same side. | |
| b. Third man opposite side in middle. | |
| (2) Carry ladder on shoulder. | |
| (b) Arm's length carry. | IFSTA Ladder Manual, P. 64, Fig. 44 |
| (1) Positions. | |
| a. Heel man and top man same side. | |
| b. Third man opposite side in middle. | Have students perform various carries |
| (2) By grasping beam, let ladder swing at arm's length. | |
| 4. Raises (three men). | IFSTA Ladder Manual, Pgs. 65, 66 and 67, Fig. 45 |
| (a) Heel man spots ladder location. | |
| (b) Lay ladder flat. | |
| (c) Heel man butts ladder. | Have students perform raise |
| (d) Other two men positioned at ladder tip. | |
| (e) Two men lift and swing under ladder. | |
| (f) They walk ladder to vertical position. | |
| (g) Pivot ladder (if necessary). | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (h) Extend fly section. | |
| (i) Check pawls. | |
| (j) Lower ladder to structure. | |
| (k) To lower, reverse procedure. | |
| 5. Carries (four men). | IFSTA Ladder Manual, P. 68 and 69, Fig. 46 and 47 |
| (a) Required for heavy wooden or metal ladders. | |
| (b) Position. | |
| (1) Two men top. | |
| (2) Two men heel. | |
| (3) Opposite sides. | |
| (4) One heel man must give commands. | |
| (c) Carry positions. | Have students perform various carries |
| (1) Shoulder. | |
| (2) Arm's length. | |
| 6. Raises (four men). | |
| (a) Leader spots ladder. | |
| (b) Lay ladder flat. | |
| (c) Two men heel ladder. | Have students perform raise |

| COURSE OUTLINE | GUIDES |
| --- | --- |
| (d) Other two men positioned at ladder tip. | |
| (e) Two top men lift up and swing under ladder. | |
| (f) Top men walk ladder to vertical position. | |
| (g) Pivot ladder (if necessary). | |
| (h) Extend fly section. | |
| (i) Check pawls. | |
| (j) Lower ladder to structure. | |
| (k) To lower ladder, reverse procedure. | |
| F. Extension ladders with poles. | |
| 1. Characteristics. | |
| (a) Heavy duty construction. | |
| (b) Lengths 35 to 65 feet. | |
| (c) Equipped with stay poles. | |
| 2. Removal procedure. | IFSTA Ladder Manual, P. 70, Fig. 48 |
| (a) Ladder location. | |
| (b) Securing method. | |
| (c) Actual removal. | |
| 3. Carries (five men). | IFSTA Ladder Manual, P. 71, Fig. 49 P. 72, Fig. 50 |
| (a) Positions. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (1) Three men one side - one each end, other middle. | |
| (2) Two men opposite side, space $\frac{1}{4}$ from respected end. | |
| (b) Ladder position. | |
| (1) Shoulder. | |
| (2) Arm's length. | |
| 4. Raises ( five men). | |
| (a) Spot ladder. | |
| (b) Lay ladder flat on ground. | |
| (c) Passing poles. | IFSTA Ladder Manual, P. 73, Figs. 51 & 52 |
| (1) Permanently attached poles. | |
| (2) Unattached poles. | |
| (d) One man heels ladder. | |
| (e) Two men at top of ladder lift and swing under. | |
| (f) Two men positioned on ends of poles. | IFSTA Ladder Manual, Pgs. 74, 75 & 76, Figs. 53, 54 & 55 |
| (g) When two top men under ladder, they begin to walk it up. | |
| (h) When ladder at 45 degree angle, pole men begin to push until ladder is vertical. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (i) Pole men brace ladder, one postioned to front, the other to the side. | Have students perform various carries and raises |
| (j) Extend fly section. | |
| (k) Lower ladder onto building. | |
| (l) Place poles (NOTE: Do not permit poles to dig, or ladder may ride out from building). | |
| (m) To lower ladder, reverse operations. | |
| 5. Alternate six man carry and raise. | IFSTA Ladder Manual, P. 77, Fig. 56 |
| (a) Similar to five man operation. | |
| (b) Positions. | |
| (1) Two men heel. | Have students perform six man raise |
| (2) Two men middle. | |
| (3) Two men top. | |
| (c) Use same basic procedure to raise, except position two men on heel. | |
| G. Attic ladders. | |
| 1. Folding attic ladder. | IFSTA Ladder Manual, P. 78, Fig. 57 |
| (a) Uses and advantages. | |
| (1) Light and short. | Have students perform operations with these ladders |
| (2) Access to attics and cocklofts. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (3) Good for confined spaces. | |
| (b) Operation. | |
| (1) Carry closed. | |
| (2) Open at use location. | |
| 2. Baby extension ladder. | IFSTA Ladder Manual, P. 79, Figs. 58 & 59 |
| (a) May be used as small extension or a "A" frame ladder. | |
| (b) Uses. | |
| (1) Gain access attics and short heights. | |
| (2) Bridge fences. | |
| (3) Support fans or salvage chutes. | |
| (c) Operation. | |
| (1) Carry to desired location. | |
| (2) Use by extending or making into an "A" frame ladder. | |
| H. Pompier ladder. | |
| VII. Special Ladder Operations. | |
| A. Overhead carry - for carrying a ladder through narrow spaces. | IFSTA Ladder Manual, P. 80, Fig. 60 |
| 1. Operation. | Perform operation |

| COURSE OUTLINE | GUIDES |
|---|---|
| (a) When required, heel man gives command. | |
| (b) All men move under ladder. | |
| (c) Extend ladder and carry it overhead. | |
| B. Moving vertically positioned ladders. | IFSTA Ladder Manual, P. 81, Fig. 62 |
| 1. Should be confined to short distances. | |
| 2. When possible, roll ladder along side of wall to new location. | Perform operation |
| D. Bridging with ladders - used to provide bridge between two open points. | IFSTA Ladder Manual, P. 82, Fig. 63 |
| 1. Three men required. | |
| 2. Two act as fulcrum and man at end supplies force. | Perform bridging operation |
| 3. Place trussed ladders with truss down so it will be under tension instead of compression. | |
| D. Church or dome raise (for use in large open spaces). | IFSTA Ladder Manual, P. 84, Fig. 65 |
| 1. Procedure. | |
| (a) Six men required. | Perform church raise |
| (b) Apply guy-ropes - two each to provide four rope ends - before raising ladder. | |
| (c) Insert rope bight around beam, below top rung. | |
| (d) Then loop over top of beam. | |

| COURSE OUTLINE | GUIDES |
|---|---|
| (e) Raise ladder. | IFSTA Ladder Manual, P. 84, Fig. 65 |
| (f) Four guy-ropes - steady ladder. | |
| (g) Use proper technique for holding guy-ropes. | |
| (h) Ladder ready for use. | |
| E. Hotel or factory raise. | IFSTA Ladder Manual, P. 85, Fig. 66 |
| F. Ladder raises under obstructions - wires, signs, and tree limbs. | |
| 1. Position ladder flat on ground at right angle to building. | Perform raise |
| 2. Top of ladder near building. | |
| 3. Position two men at heel and two men 1/3 distance from top. | |
| 4. Middle men lift while heel men butt and push ladder up side of wall. | |
| G. Hoisting ladders - hoisting ladders with ropes is easiest and safest method to get ladders to roofs or upper floors. | IFSTA Ladder Manual, Pgs. 87, 88, 89 & 90, Figs. 70-76 |
| 1. Method. | Practice hoisting ladders |
| (a) Tie large bowline. | |
| (b) Insert between rungs 1/3 from top. | |
| (c) Pull loop through and place over beam ends. | |

| COURSE OUTLINE | GUIDES |
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| (d) Hoist ladder.<br><br>(e) This method provides additional leverage. | |

NORTH CAROLINA DEPARTMENT OF COMMUNITY COLLEGES

FIRE SERVICE TRAINING

## Inspection of Ladders

Ladders in service should be inspected periodically. Many departments inspect ladders immediately following return of apparatus to the stations. Those responsible for such inspections should carefully check for cracked or splintered beams, trusses and rungs. The rungs of extension ladders to which the fly ladder has been locked should receive particular attention.

Other points to be inspected are: Halyards, frayed, cut or worn; tierods loosened or unbolted; ends of extension ladder stops worn; loosened, broken or worn ladder locks; spurs worn smooth; splintered poles, particularly at points where attached to ladder; breaks and splits in rung locks, guides, braces and other wooden members, etc.

Revarnishing ladders (not painting) at intervals is a good means of preserving their strength.

LADDER LENGTH APPROXIMATE REACH

| Length of Ladder in Feet | Reach |
|---|---|
| 10 | 9' 4" |
| 12 | 11' 5" |
| 16 | 15' 2" |
| 18 | 17' 1" |
| 20 | 19' 0" |
| 24 | 22' 11" |
| 26 | 24' 11" |
| 28 | 26' 10" |
| 30 | 28' 9" |
| 32 | 30' 8" |
| 35 | 33' 7" |
| 36 | 34' 6" |
| 40 | 38' 7" |
| 45 | 43' 4" |
| 50 | 48' 1" |
| 55 | 52' 11" |